The European Network on the Health and Environmental Impact of Nanomaterials

NanoImpactNet

Abstract book

3rd NanoImpactNet Conference

Building a bridge from NanoImpactNet to nanomedical research

Lausanne, Switzerland

14-17 February 2011

Hosted by the Institute for Work and Health, Lausanne, Switzerland

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7.1.26 Critical exposure to ultrafine particles during highway maintenance work

Reto Meier[1], Wayne Cascio[2], Michael Riediker[1]

[1] *Institute for Work and Health, Lausanne, Switzerland*
[2] *East Carolina University, Greenville NC, USA*
Email: reto.meier@hospvd.ch

Traffic-related emissions are associated with increased cardiovascular and pulmonary morbidity and mortality. Highway maintenance workers spend up to eight hours per day exposed to traffic emissions. The aims of our current project are to provide a better understanding of the workers' exposure to traffic stressors, particularly inhaled particles and noise, and to assess their cardiovascular, pulmonary, and pro-inflammatory health effects.

We have a particular interest in the exposure to ultrafine particles as they have been associated with increased pro-inflammatory and pro-thrombotic biomarkers, as well as altered heart rhythm. These associations differ for particles from different sources such as combustion, brake and road surface wear [1]. To quantify the workers' exposure we use a panel study design with repeated measurements to observe 50 road maintenance workers over 5 non-consecutive working days. Measurements are ongoing.

Preliminary data shows that exposure to ultrafine particles is highly variable depending on work site, work activity and work shift. Mean daily particle counts range from 20'000 to 200'000 particles per cm^3. Transient peaks averaged over 15 minutes can reach more than 1'000'000 particles per cm^3. This broad gradient of exposures offers an excellent opportunity to establish dose-dependent effects of the particles generated and re-suspended on the roadway.

[1] Riediker et al. 2004. Cardiovascular effects in patrol officers are associated with fine particulate matter from brake wear and engine emissions. Particle and Fibre Toxicology 2004, 1:2